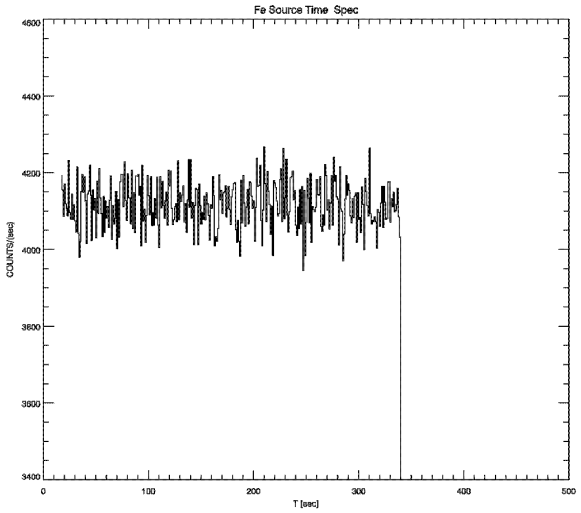
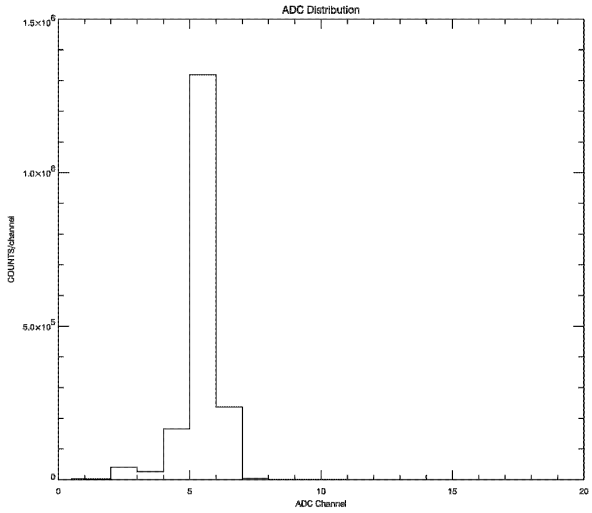
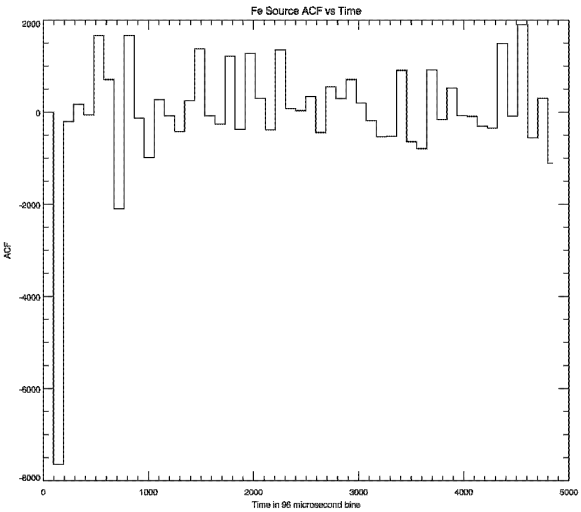
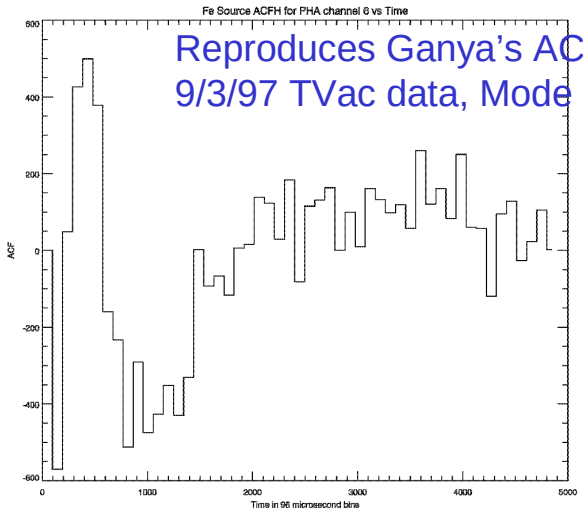
Some Studies needed. March 28-April 10, 2001

1. Analyze Boeing TV data to extract correct long tail amplifier pulse.
   - Reproduce ACF result of Ganya's ✓
   - Compare with Fe source MC, and TVac data. ✓
2. Run MC on Crab and Cyg X-1 simulated time-energy spectra.



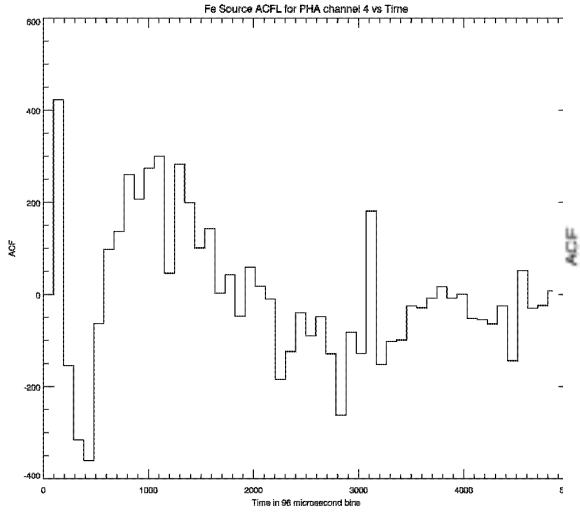


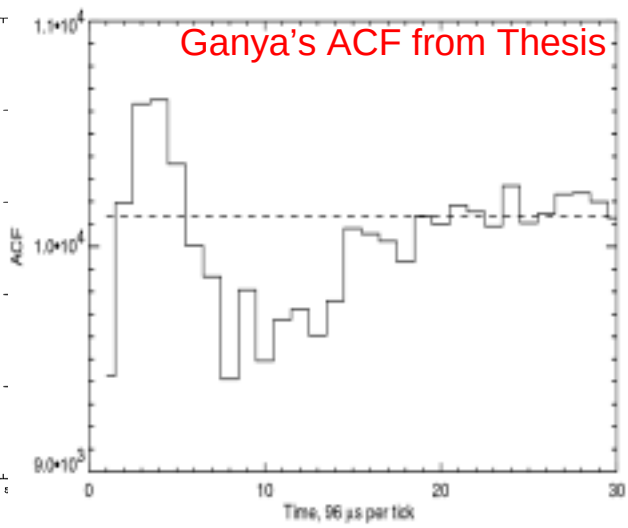




Reproduces Ganya's ACF.
9/3/97 TVac data, Mode 2, Det 0.

4.8ms





Ganya's ACF from Thesis

2.9 ms

- Compare Fe source: MC and TVac data.

TVac files used are:

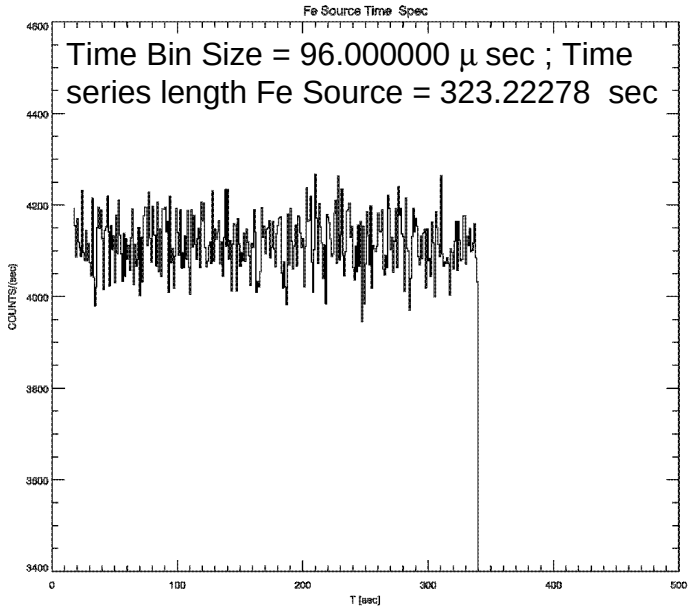
USA_2_Y1997_D246_084750_D246_085807.filt

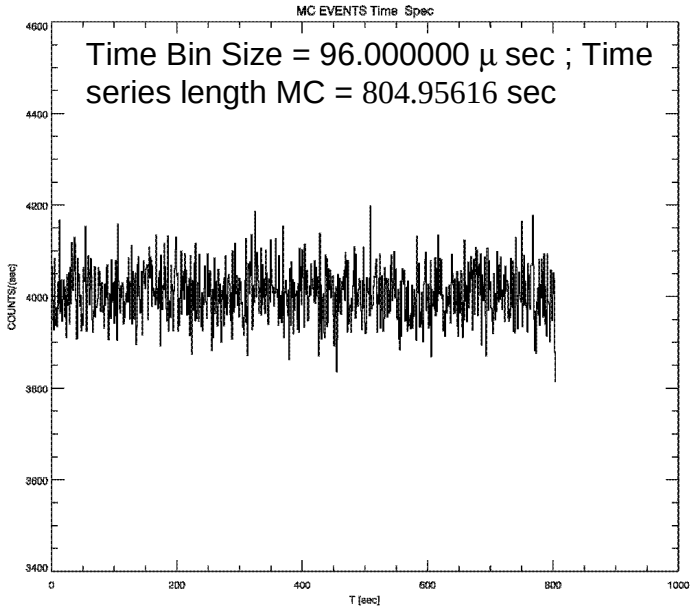
(Until more data is processed correctly.)

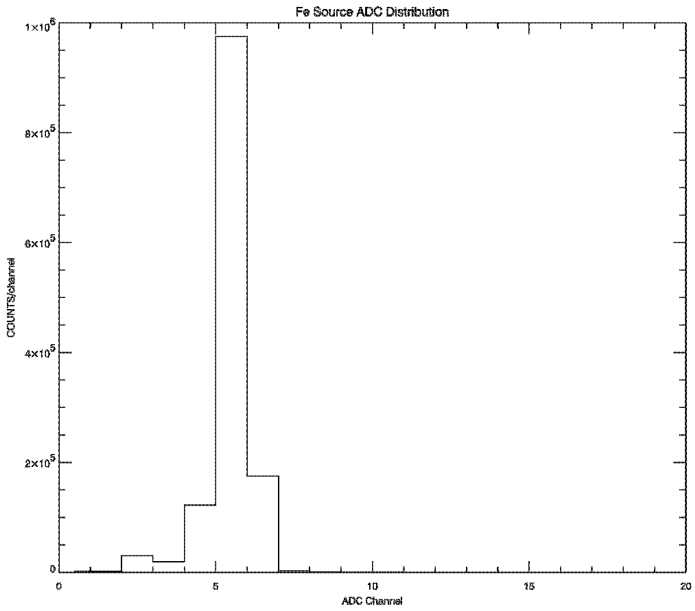
MC files used are:

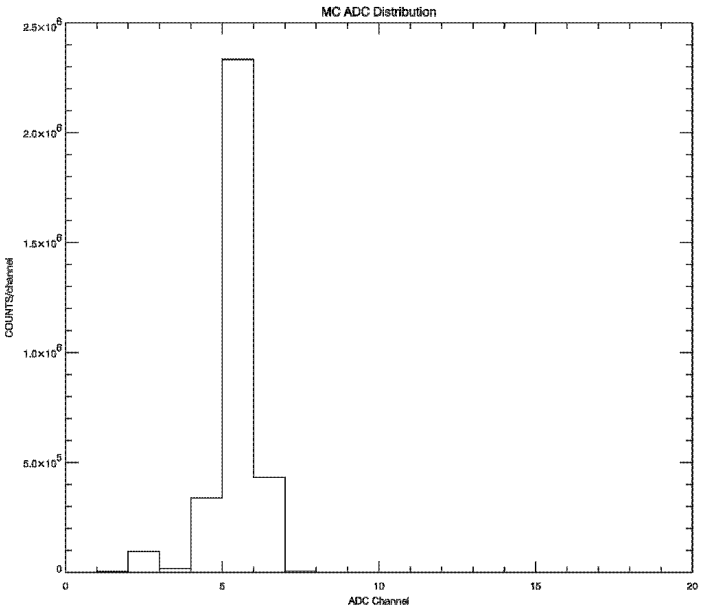
USA_MC_FE_SOURCE_MODE_96microsec_805sec_4075Hz_PerfectAmp_PSP_DecendingCal.gz

USA_MC_FE_SOURCE_MODE_96microsec_805sec_4367Hz_PSP_decendingCal.gz

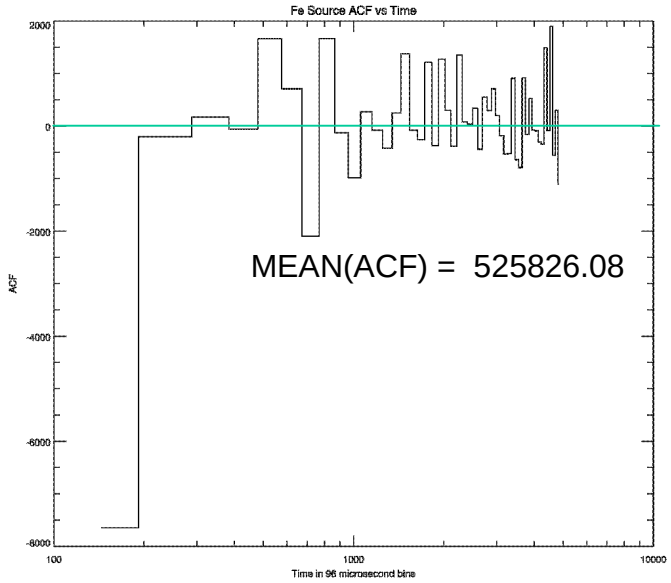


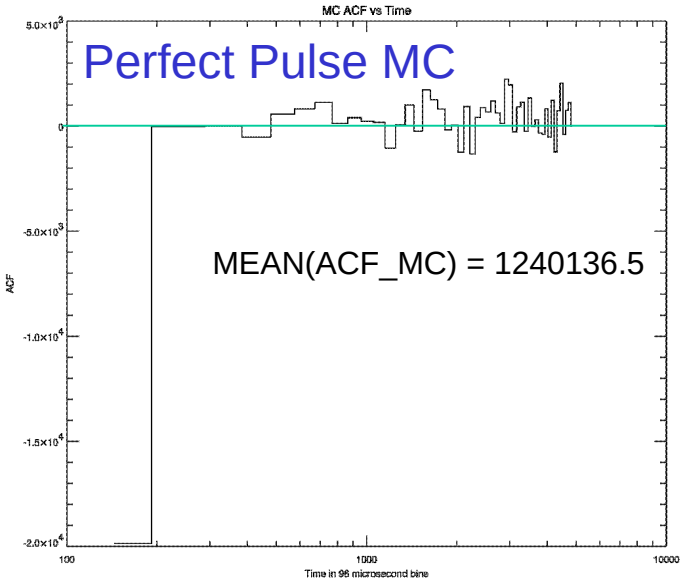


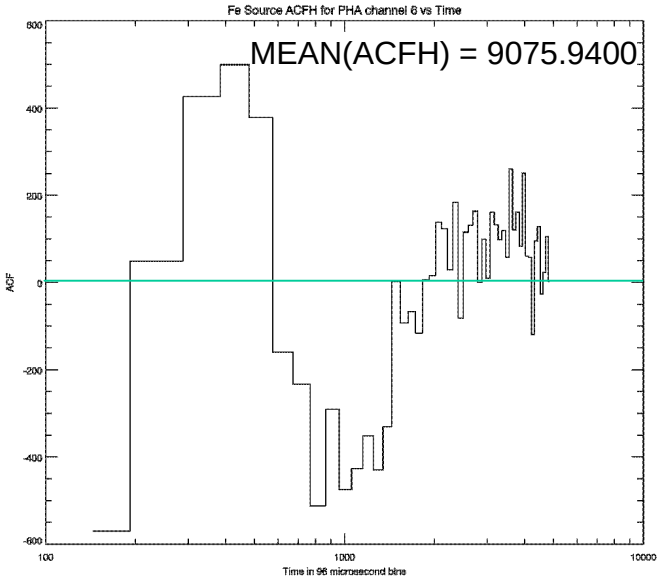


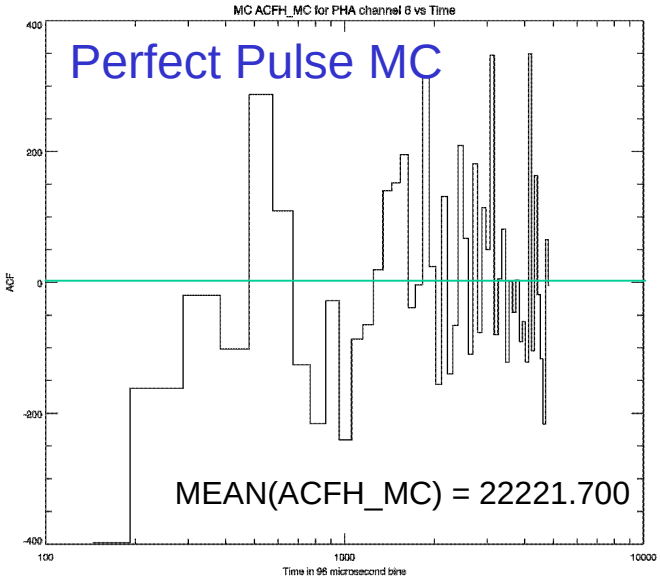


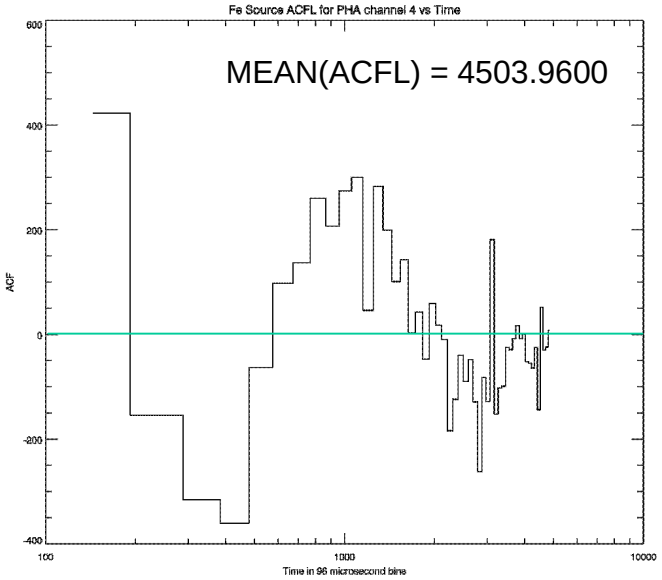
- Compare Fe source: TVac and MC data.

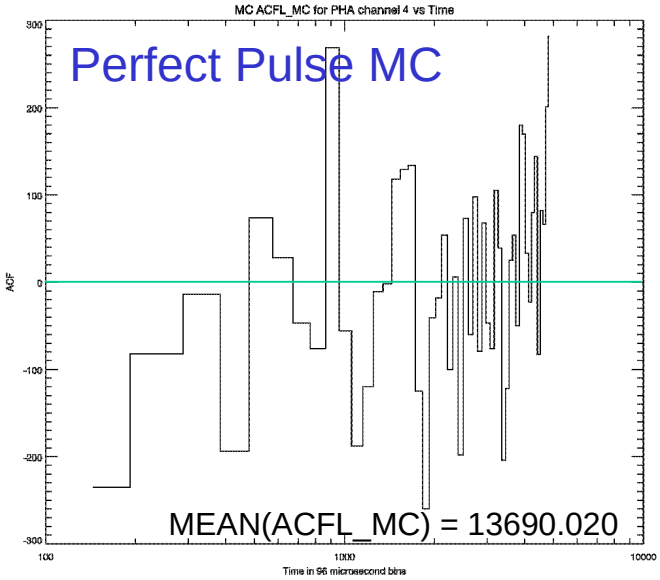




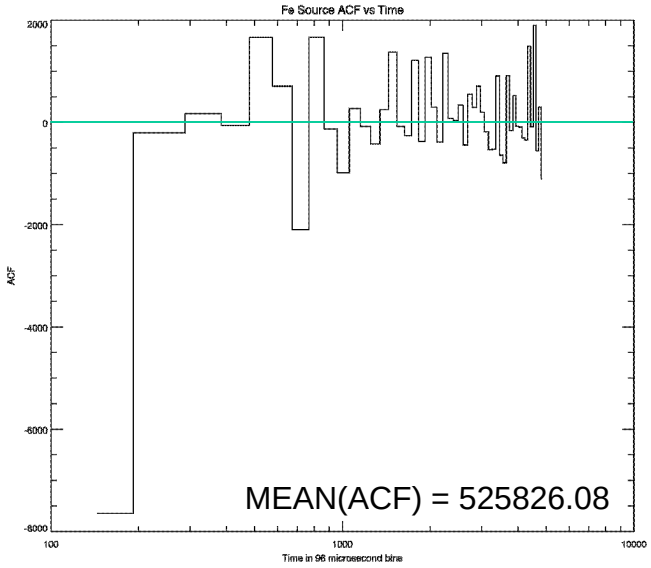


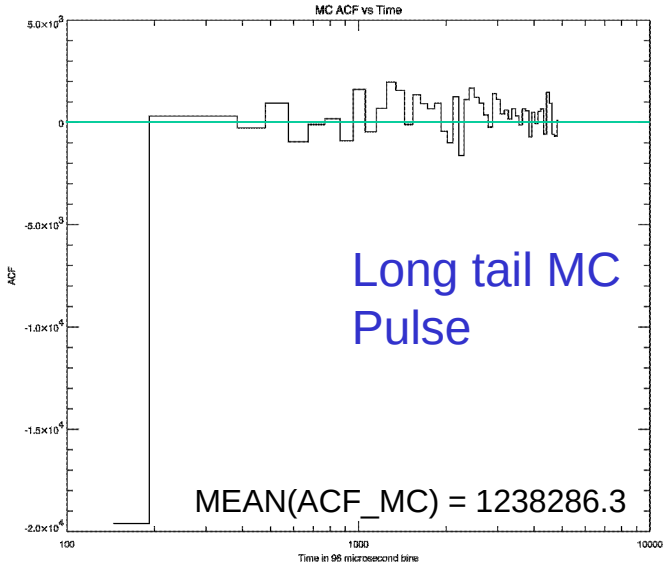


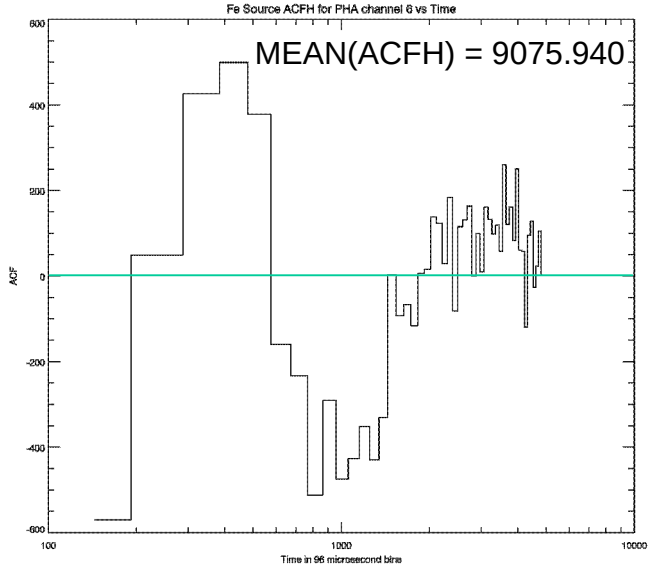


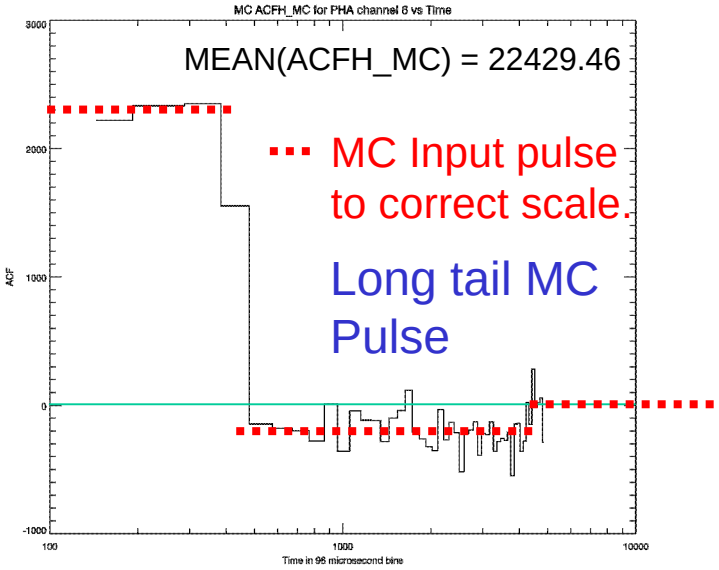


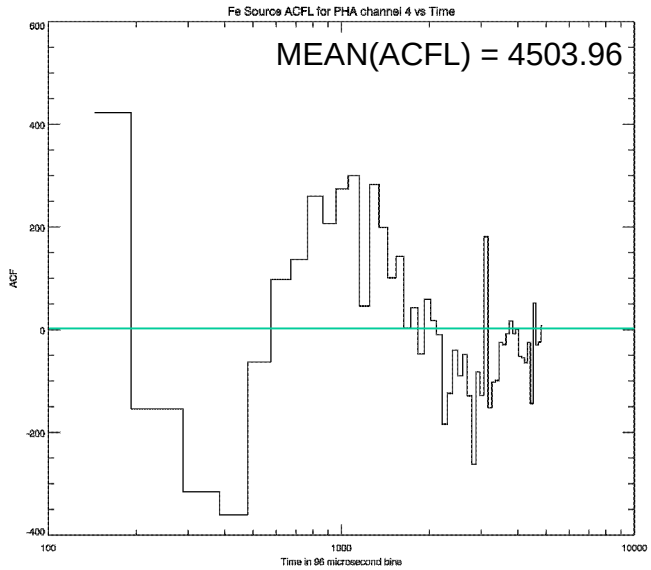
- Compare Fe source: TVac and MC data.

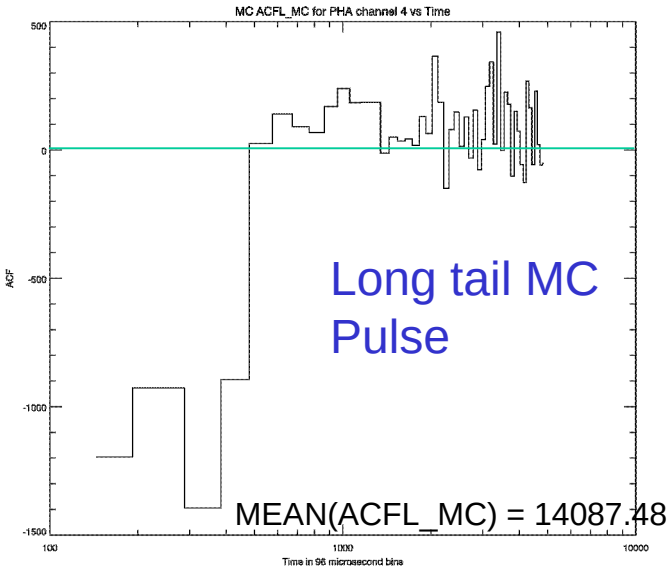












Summary and Conclusions (EDB 3-30-01)

• Page 1 of this report to the USA SWG shows that I have reproduced the Auto Correlation function in Ganya's thesis, figure (5.33), on page 107 of her thesis. I did this by directly calculating the ACF as indicated in equation (5.8) in Ganya's thesis. This approach to the calculation of the ACF is very efficient in IDL due to its easy formulation as a vector arithmetic problem.

• In all of my ACF figures I show ACF = ACF - <ACF> starting at bin 1, where bin 0 would be the first bin. The <AFC> does not include the 0^{th} bin. Thus, no correlation in AFC is indicated by no significant deviation from 0 as a function of Δt.

• Bin 1 in all the AFC except one of them shows a significant drop below 0. This is an effect of deadtime as is clear in the "perfect pulse" MC result referred to in the next point.

• I have taken the ACF out further in time (4.8 ms) than Ganya did (2.9 ms), and this shows additional structure in the ACF for the TVac data. Page 3 in this study show this additional structure that continues oscillating for milliseconds. Page 3 also shows the results from my "perfect pulse" MC, which shows no obvious structure beyond the deadtime (1^{st} bin) and statistical fluctuations. Note that the top panels show no structure for data that is not cut on energy in both TVac and MC data to good accuracy.

• On comparing my initial very simple long pulse model MC with the TVac data on page 4, we see that the agreement is not good. However, I have superimposed in red dashed lines the MC input pulse shape, relatively scaled correctly in amplitude (size of first level is correct relative to second level, …), and it fits the MC-ACF very well. I believe that this result verifies Gary Godfrey's model that ΔACF(Δt) follows the pulse shape at the ADC,

$$\Delta ACF(\Delta t) \sim dr_0/dE)_E * \delta E(\Delta t),$$

equation 5.9 in Ganya's thesis.

• Given these results I have high hopes that we can model the "effective" USA electronics pulse that is causing the distortion in the PSD. All I need is lots of TVac data to estimate the pulse, and then lots of Crab data combined with Crab MC to check the results. I hope this will be completed by the end of April. I can't work on this project next week due to the GLAST SWG and Gamma 2001 meetings in Baltimore, but I can't wait to get back to it!